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INSTRUCTION MANUAL & SERVICE MANUAL HOT AIR BLOWER

ORLIGNO 600

INSTRUCTION MANUAL
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1. Hot air blower destination

Wood gasification hot air blower type ORLIGNO 600 is commonly used in industrial buildings or other facilities as: warehouses,workshops, hangars,tents or outbuildings in places where there's no heating installation. They're also used as a source of hot air in technological purposes in drying houses of wood, grains, herbs or fruits.

ATTENTION!
Using fuel different than the recommended not guarantees optimum boiler operation and achieving parameters featured in technical data. It can also affect durability of the boiler and its components.

ATTENTION!
Using fuel different than the recommended is treated as wrong boiler operation and resultant performance irregularities cannot be reason for complaint.

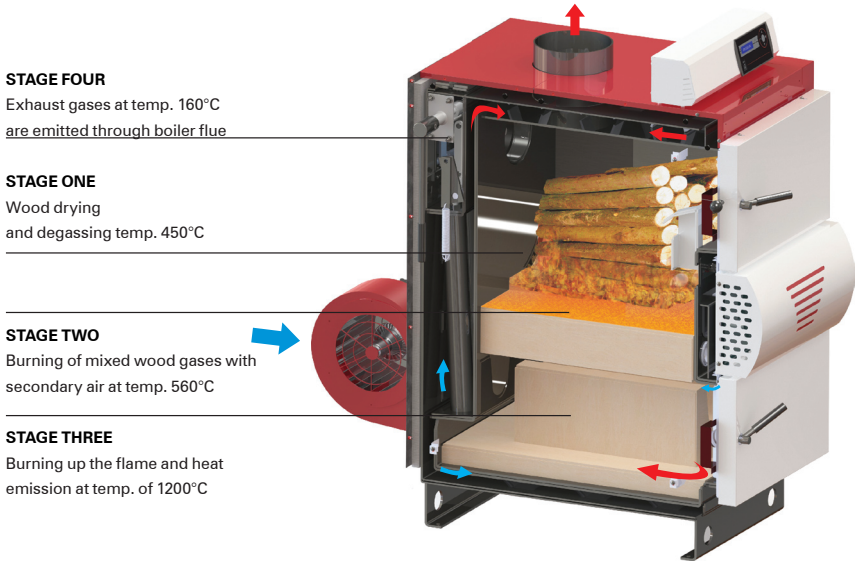
ATTENTION!
ORLIGNO 600 is equipped in controller with wide temperature range fit for every purposes. Controller protects boiler against overheating with blow fan turning off and back fan activation.

2. Principle of work

Gasification boilers utilize process of dry, pyrolitic wood distillation. During wood burning with limited amount of air, wood changes into charcoal. Gasification process creates large amount of wood gases which are directed to ceramic nozzle and burned in flame form in bottom chamber. This method of wood burning efficiently make use of wood as a fuel.

Heat is transfered through loading, burning chamber's walls and vertical heat exchanger to circulating cold air between inner and outer ORLIGNO 600 bodies.

Heated air is then blown directly through outlet located in upper part of hot air blower to the premise.



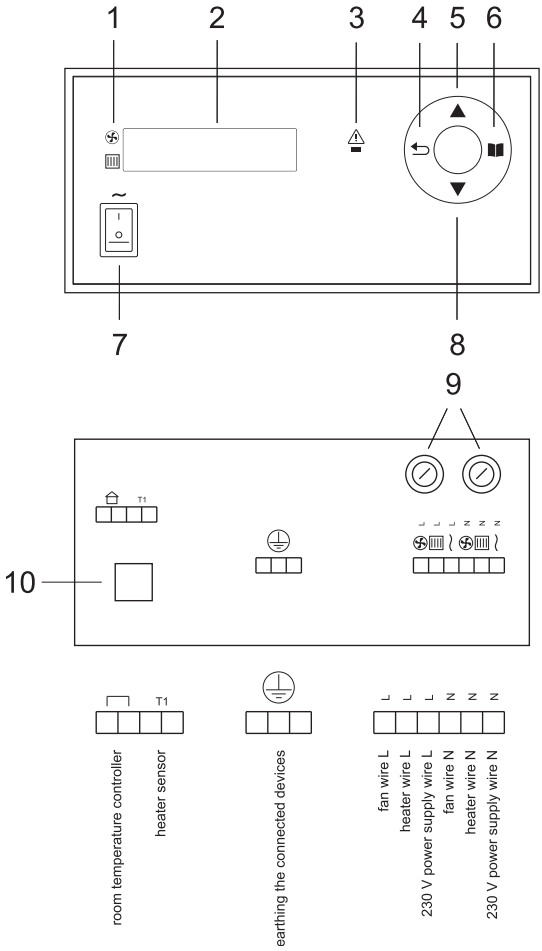
3. Delivery specification

ORLIGNO 600 hot air blower is delivered fully assembled, attached with screws to pallet and wrapped in foil. ORLIGNO 600 comes with: set of cleaning tools 3 pcs and documentation (manual, warranty card and quality certificate).

ORLIGNO 600 must be stored in dry and indoor places.

4. Description of the controller

4.1. Front panel of EKOSTER 3



1. Device symbols
2. Display
3. Failure diode
4. Lightning-up / Pause / Return button
5. Increase temperature button
6. MENU button
7. Switch on / off
8. Decrease temperature button
9. 2,5 A fuses
10. Power supply socket for remote CONTROL panel

Display symbols description

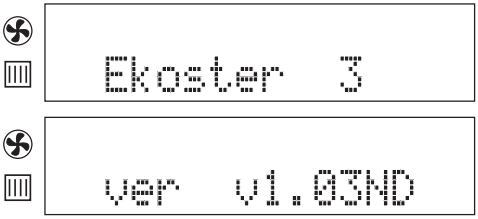
- front fan
- heater

ATTENTION!
If the display of the controller doesn't turn on after switching on check the power supply and fuses. If the fuses are damaged replace them both with new 2,5 A ones. If the display is still off – contact the service.

ATTENTION!
The fuses should be replaced with the controller switched off and unplugged.

4.2. Controller switch-on

Turn on the controller using on/off switch. The display should show the name of the controller and the programme number.



Next the display will show the temperature from the sensor and the current working condition of the connected devices.

4.3. Boiler working parameters setting and lightning up

During boiler operation the display shows the current temperature from the sensor.

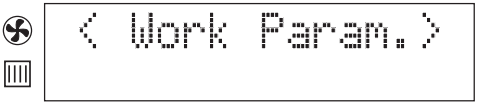
By pressing ▲ or ▼, it is possible to adjust the temperature setting of the boiler. Temperature range from 50 °C to 120 °C .

ATTENTION!

Symbol ⇑ or symbol ⇓ on the display inform about the current temperature change in the boiler ⇑ means that the temperature is changing toward desired, ⇓ means that the temperature is decreasing towards the "HI" parameter.

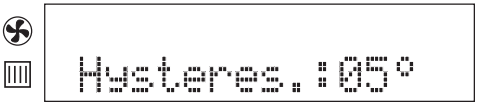
4.4. Service mode - OPERATION PARAMETERS

Service mode is for setting changes and various parameters of the devices, e.g. fan and heater operation. Press 📖 for a few seconds to enter service mode. The display will show WORK PARAM. Further pressing 📖 results in entering settings for various operation parameters. Use ▲ and ▼ buttons to change the selected parameters.



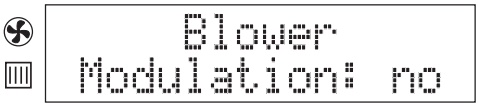
Fan hysteresis

This parameter shows how much the temperature must fall from set temperature to turn the fan on. Temperature setting range: 0 °C to 9 °C.



Blower modulation

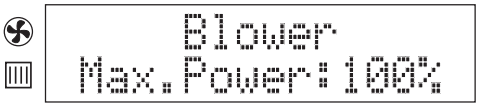
This parameter turns on or off the modulation of the blower. With modulation ON (YES on the display) the blower will slow down when the temperature reaches the set level and will speed when the temperature falls down. Modulation OFF is signalled by “NO” on the display. Change range: YES / NO.



ATTENTION!
Fan modulation is limited to hysteresis i.e. it works within the range of set boiler temperature and set hysteresis parameter. Below hysteresis the fan works with maximum set power.

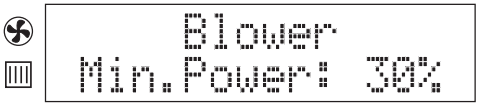
Maximal fan power control

This parameter allows for setting the maximum fan power. Setting range: 30 % - 100 %



Minimal fan power control

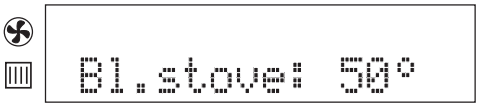
This parameter allows for setting the minimal fan power. Setting range: 30 % - 70 %



ATTENTION!
Some fans do not turn on when the power is set at the lowest minimum. It is recommended to increase the fan power in such cases.

Heater turn-on temperature

This parameter sets the temperature above which the heater turns on and starts operating. The heater will turn off when the temperature falls down by 10 °C below the temperature set on the sensor. Temperature change range: 40 °C to 120 °C.

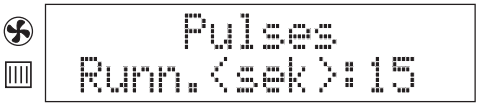


Extinguish time control

This parameter allows for setting the fan operation (extinguish) when the temperature on the sensor falls down to 30 °C . Setting range: 0 - 45 minutes.

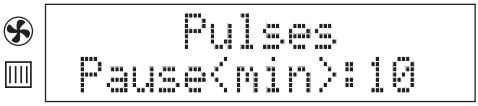
Blow through - operation time

This parameter sets the fan time operations when the BLOW THROUGH function is on. Time range: 0 to 90 seconds.



Blow through - pause time

This parameter sets the pause time for fan operation (in minutes) between blowthroughs. Time range: 1 - 60 minutes.



ATTENTION!
Blow through function is activated when the boiler reaches the set temperature.

ATTENTION!
Blow through will not activate when:

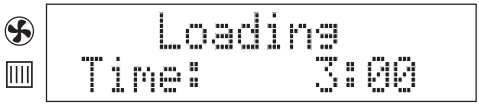
1. The temperature on the sensor will be* 10 °C *higher than the temperature set for the boiler.

2. The temperature will be lower than set by the "HI" parameter.

ATTENTION!
Setting the operation time for 0 will turn off the blow through function

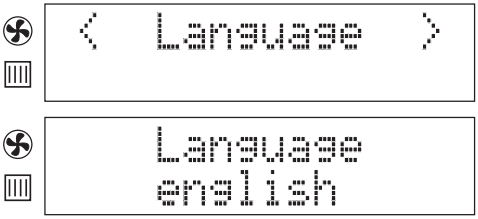
Fan pause - stoking

Parameter setting the fan pause time necessary for stoking the boiler. Time range: 0:30 to 9:30 minutes.



4.5. Service mode - LANGUAGE

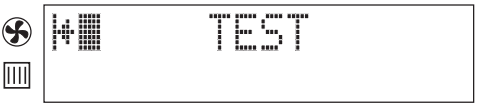
Service mode is for setting the language of the control panel. To enter the LANGUAGE service mode press 📖 for a few second until WORK PARAM. shows on the display. Choose the language (Polish/English/German) using ▲ button.



4.6. Service mode - TEST

This function helps with checking the accuracy of connection. To enter TEST service mode press 📖 for a few seconds until WORK PARAM.; shows on the display. Choose TEST using ▲ button.

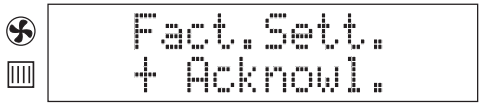
Each consecutive pressing the button 📖 will result in showing the ▮ symbol by the icon representing individual device: fan / heater. By pressing ▲ or ▼, buttons individual devices are turned on / off.



4.7. Service mode - SERVICE SETTINGS

This function cancels all settings entered by the user and returns devices to service settings. To enter SERVICE SETTINGS mode press 📖 for a few seconds until WORK PARAM. shows on the display and then using ▲ button change to SERVICE SETTINGS screen.

By pressing 📖 button again changes to service settings save screen. To save the changes press ▲.



4.8. Room temperature controller

It is possible to install room temperature controller which will turn on/off the heater depending on the temperature in the room. The heater will turn on when the temperature on the sensor reaches the minimal set level.

To install the room temperature controller:

1. Remove circuit armature from the socket marked ⌂, on the back of the controller.

2. Install the room temperature controller in the socket.

4.9. Temperature sensor damage

If the temperature sensor is damaged the controller will STOP and - will appear on the display instead of the temperature. The red diode FAILURE will be on ⚠.

4.10. Technical data of the controller

Temperature range	- 58 °C to + 390 °C
Boiler temperature settings	+ 50 °C to + 120 °C
Heater temperature settings	+ 40 °C to + 120 °C
Smooth blow-through control	yes
Controllable min. fan power	30 - 70 %
Controllable max. fan power	30 - 100 %
Fan hysteresis	0 °C to 9 °C
Heater hysteresis	10 °C
Blow-through control	work time: 0 - 90 sec.
	pause: 1 - 60 min.
Controllable boiler extinguishing time	0 - 45 min.
Input power	fan: 100 VA / 230 V
	heater: 100 VA / 230 V
Voltage AC	230 V, 50 Hz
Electrical protection	2 x 1,25 A
Relative air humidity	< 95 %
Protection class	IP 40
Insulation class	II
Ambient temperature	0 °C to + 40 °C
Software class	A
Operation type	fan: 1Y
	heater: 1B

4. Gasification process

Gasification hot air blower ORLIGNO 600 must operate in specified conditions.

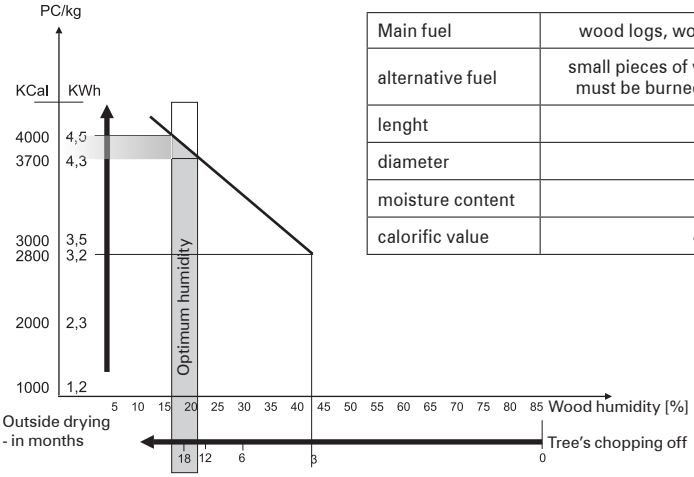
Optimal hot air blower temperature is 85 - 90 °C. At lower temperatures gasification process is not running correctly – hot air blower cannot reach nominal power and fuel usage is relatively higher. Wood drying in loading chamber is crucial stage in gasification process – at lower temperatures hot air blower cannot reach right temperature and gasification process is disturbed. Main source of heat in Orligno 600 is gas flame created during gasification process, if main conditions won't be met for proper gasification process, amount and quality of flame will be inadequate.

Essential factor influencing right gasification process is quality, moisture content and type of burned wood. The best is hardwood (beech, oak, harnbeam) with moisture content 15-20%. Lenght of wood should be the same as depth of loading chamber. Usage other types of wood like spruce is acceptable, however heat exchanger pollution will increase and time between boiler stoking will decrease. In order to determine proper moisture content it is recommended to use moisture meter (pic. 3)

Appropriate wood assures correct boiler operation. Usage of wood with different parameters other than recommended will affect proper work of boiler.

Fuel specification

Main fuel	wood logs, wood in halves and quarters
alternative fuel	small pieces of wood, shavings, briquettes must be burned together with wood logs
lenght	50 cm
diameter	15 - 25 cm
moisture content	15 - 25 %
calorific value	4,1 - 4,4 kW



Pic.2 *Wood humidity chart*

Pic.3 *Moisture meter*

5. Boiler start-up

Before first start-up of Orligno 600 it is advisable to check:
- if there's no flammable substances close to hot air blower
- tightness of connecting pipe between flue and chimney
- placement of bottom chamber's firebricks as they must be placed directly under the nozzle hole
- if 230 V power plug is connected to socket
- if front fan is blowing the air to upper chamber through primary air channels located on front left and right side of upper chamber (fan is activated with ⮌).
- if front fan is blowing air through holes in nozzle

5.1. Lightning up

In order to light up in the hot air blower:

1. Pull in chimney flap lever (exhaust gases duct opened).
2. Open upper door.
3. Put papers, small wood pieces and light up.
4. Close upper door and open bottom one thus creating natural draft.
5. Wait 15-20 minutes to create ember layer covering whole upper chamber.
6. Fully load the chamber with halves of wood logs put along the chamber.
7. Close upper and bottom door.
8. Close chimney flap lever (IMPORTANT!).
9. Turn on fan on the controller by pressing ⮌.

Display will show informing about lightning up process.

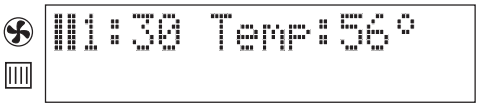
ATTENTION!
It is forbidden to turn the fan on with opened upper door.

ATTENTION!
Take into consideration loading chamber depth while stoking the hot air blower. Wood dimensions larger than recommended may cause troubles during closing the upper door. It is necessary to avoid closing upper door with force – it may damage the door.

ATTENTION!
Acceptable wood humidity of 25% is reached after 12 months of drying.
Recommended level of 15-20% is reached after 24 months of seasoning (Pic. 2)

5.2. Stoking hot air blower

Burning period in ORLIGNO 600 hot air blower is 7-12 hours. In order to avoid discomfort with fuel stoking it is recommended to check fuel level each 5-7 hours. To check fuel level and possibly stoke the blower one should:- Turn the fan off before stoking the boiler by pressing ⮌ which is signalled on the display by ⏸ along with the countdown to restart. Stoking time is set in the service mode OPERATION PARAMETERS – see **Fan Pause - stoking**.



- Open chimney flap lever

- Open upper door and stoke upper chamber.

- Close the door, chimney flap and turn on the fan on the controller

Keep in mind that during the fuel stoking some wood parts may get between flue flange and chimney flap which would make impossible to close the flap tightly.

During fuel stoking (it is recommended to stoke the fuel after wood fully burned till glow layer) stir with poker ash deposited on the sides of loading chamber.

6. Maintenance

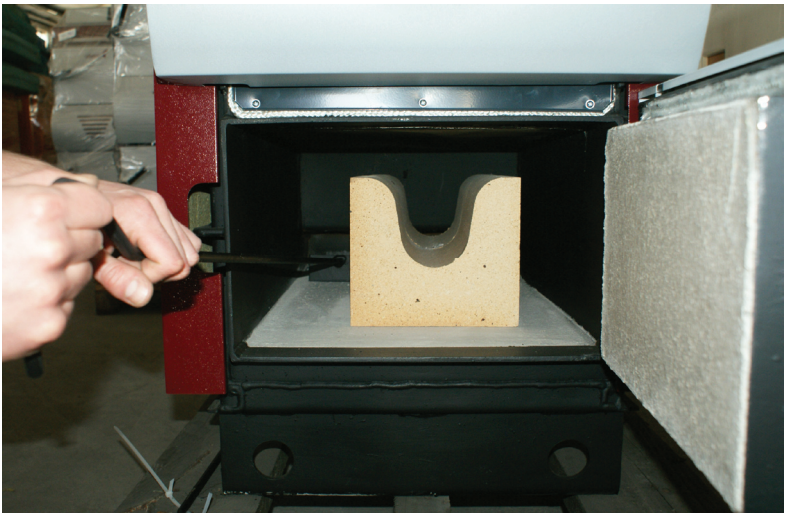
6.1. Hot air blower maintenance

Boiler needs to be serviced for idle time (summer season, absence of user).

Sides of loading, ash chamber, chimney flap and heat exchanger needs to be cleaned regularly (it is advisable to burn softwood like spruce to remove pitch before summer season). After burning softwood leave the boiler open – in this way damp is not condensing on the sides of boiler.

ATTENTION!
It is advisable to control the hot air blower annually in order to prepare it well for the next heating season.

Ash created during wood burning falls down through the nozzle to ash chamber, that's why it is advisable to remove the ash from bottom chamber.



Each time before lightning up the boiler it is recommended to clean loading chamber. Ash needs to be removed through the nozzle. Use the tools supplied with the boiler.

Pitch is created during gasification process. Amount of created pitch depends on wood type, humidity and water temperature coming out and into the boiler. It is recommended to clean loading chamber at least once a month.

Particles in exhaust gases flowing through the heat exchanger create on their surface deposit. Deposition causes lowering of inner pipes dimension and lowering of heat exchange surface. That is why it is necessary to clean heat exchanger pipes each time after boiler stoking.

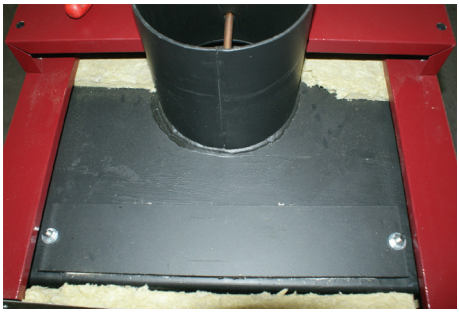
Follow the steps of how to clean heat exchanger's pipes:

1. Remove back upper heat exchangers panel.

2. Unscrew bolts holding heat exchangers' lid.

3. Clean each of pipes with round tools moving it up and down.

1



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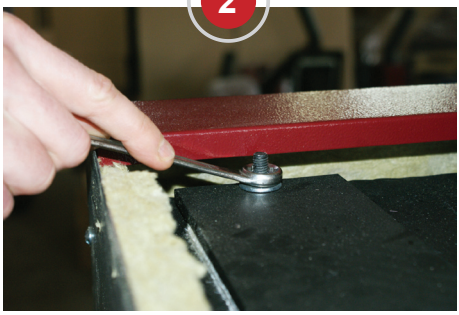
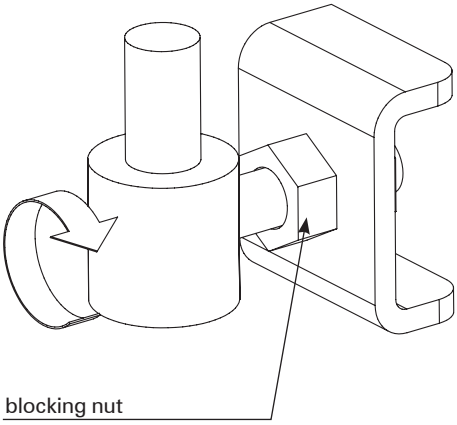


3

6.2. Hot air blower tightness

It is important to assure tightness, mostly door tightness. Leaks cause that exhaust gases escape to boiler room but most importantly it may leads to uncontrolled burning. To assure door tightness, rope of upper door needs to be controlled and qresed at least once a 2 weeks with any gresce or oil. This assures that rope adhesives correctly to door frame. Hot air blower tightness can be assured also by hinges regulation.

To adjust boiler door one should
a) Remove the door
b) Loosen screw
c) Rotate both hinges 360°
d) Screw up the nut.



ATTENTION!
Door adjustment needs to be done on both hinges!

6.3. Fan maintenance

It is important to keep both fans cleaned. Keeping the fan blades cleaned directly influences hot air blower. It is recommended to take off front fan cover to remove ash that may leads to fan power decrease and may damage the fan. It is acceptable to clean the fan blades with brush with soft bristle or vacuum cleaner.

Cleaning of both fans should be done at least once a year after or before heating season.

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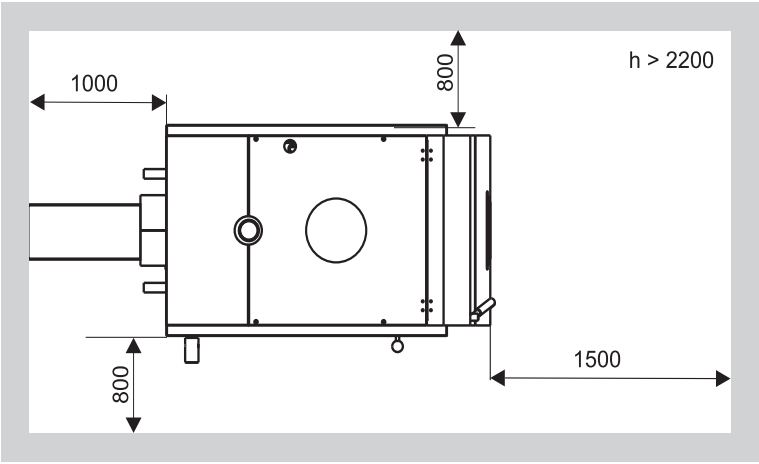
1. Installation

Hot air blowers should be installed according to binding rules and norms.

Rules and norms should be followed according to solid fuel boiler assembly in countries in which the hot air blower is sold.

1. Boiler room height should be at least >2,2 m for easier boiler cleaning.
2. Distance from boiler room walls should allow for free access to boiler sides and should be at least as shown on picture „ORLIGNO 600 placement".
3. Boiler room should be free of any electric installation not intended for boiler installation.



Pic.1 *ORLIGNO 600 placement*

1.1. Boiler-room ventilation

According to european safety regulations each boiler room should have supply-exhaust ventilation ensuring correct hot air blower operation and user's safety. Lack of ventilation or its obstruction is the main reason of incorrect hot air blower operation (i.e. hot air blower cannot reach set temperature). Exhaust ventilation removes from boiler room used air and harmful gases. Boiler room with natural draught cannot have installed mechanical ventilation.

1.2. Supply air ventilation

1. Ventilating duct section should have at least 50% area of chimney's section and not less than 20 x 20 cm. Duct should be placed 1 m above the floor.
2. Ventilating duct should have installed device for air flow control; device shouldn't limit duct section above 1/5. Ventilating duct should be made of non-inflammable material.

1.3. Exhaust ventilation

1. Exhaust duct should be made of bricks with section of at least 25% of chimney section not less 14 x 14 cm. Inlet hole cannot have any devices that reduce its section. Outlet hole should be placed close to the ceiling led out 1,5 m above the roof. Ventilating duct should be made of non-inflammable material.
2. Height of the boiler room min. 2,2 m.

1.4. Hot air blower connection to chimney system

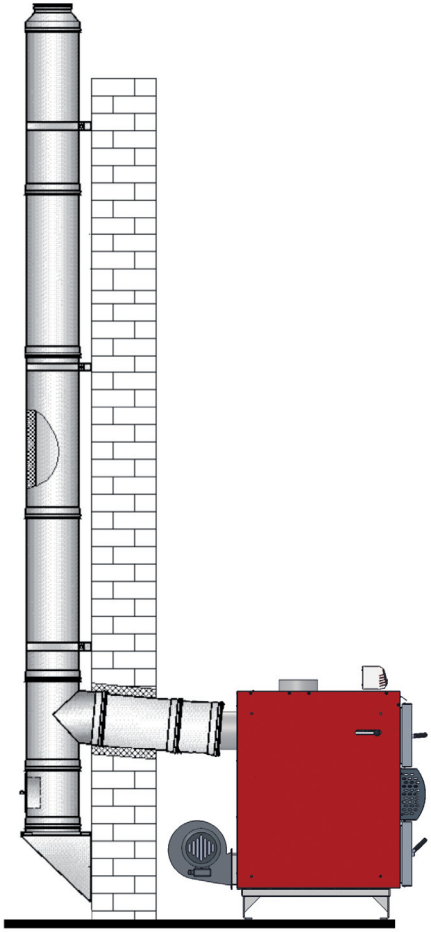
Chimney system for hot air blower should be installed according to norm EN -13384 and below recommendations should be taken into account:

- pipe connecting hot air blower with chimney should be as short as possible (with minimal distances to walls acc. to pic. 1) with ascend of at least 5°

- pipe diameter connecting hot air blower with chimney must be at least the same as hot air blower flue

- chimney draft cannot be smaller than the one required in technical data of this manual

- pipe connecting hot air blower with chimney should be made of temperature resistant material



Pic.2 *Stainless steel double wall chimney system connected with Orligno 600*

ATTENTION!
It is recommended to install draft regulator which stabilizes chimney draft and in case too big underpressure in chimney opens up and sucks in air from boiler room instead of hot air blower.

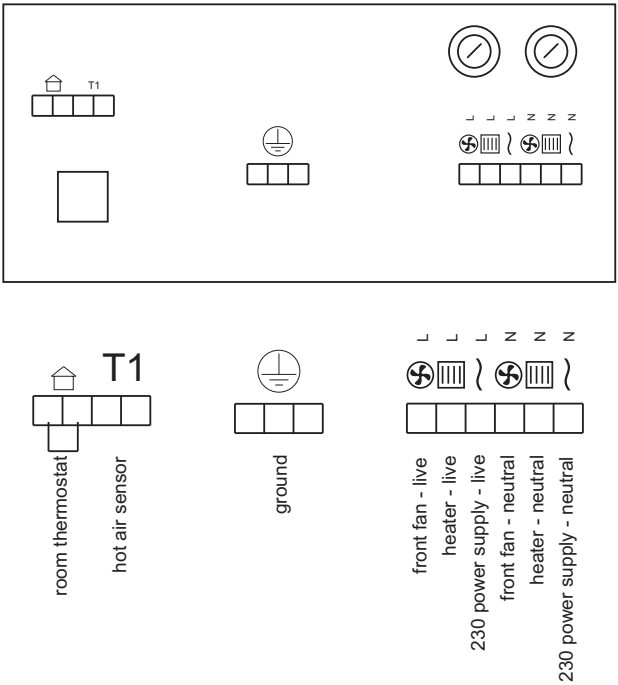
2. Technical data

2.1. EKOSTER 3 – technical data

Temperature range	from - 58 °C to + 390 °C
Boiler temperature settings	from + 50 °C to + 120 °C
Heater temperature settings	from + 40 °C to + 120 °C
Smooth blow-through control	yes
Controllable min. fan power	30 - 70 %
Controllable max. fan power	30 - 100 %
Fan hysteresis	from 0 °C to 9 °C
Heater hysteresis	10 °C
Blow-through control	work time: 0 - 90 sec.
	pause: 1 - 60 min.
Controllable boiler extinguishing time	0 - 45 minute
Input power	fan: 100 VA / 230 V
	heater: 100 VA / 230 V
Voltage AC	230 V, 50 Hz
Electrical protection	2 x 1,25 A
Relative air humidity	< 95 %
Protection class	IP 40
Insulation class	II
Ambient temperature	0 °C to + 40 °C
Software class	A
Operation type	fan: 1Y
	heater: 1B

2.2. EKOSTER 3 – installation recommendations

1. Controller is adjusted to cooperate with solid fuel boilers.
2. Controller must be installed by qualified person.
3. Controller cannot work at temperatures higher than 40°C.
4. Controller should be protected against water flooding and steam condensation.
5. Controller should be installed and used according to handling rules with electric equipment.
6. Fuse burning as a result of wrong pump connection is not considered as a warranty matter.
7. It is recommended to check controller's settings before lightning up.
8. Controller is equipped with two 1,25 A fuses.



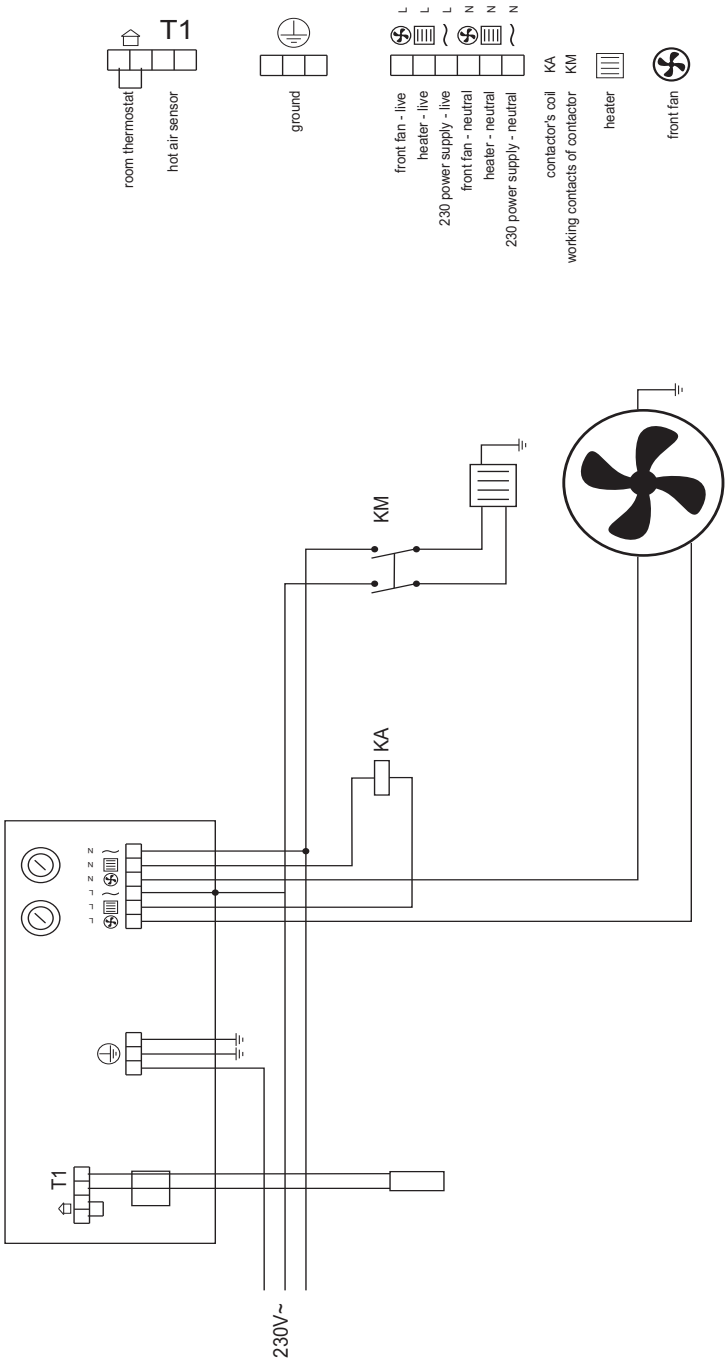
Rys.3 *Ekoster – back panel view.*

ATTENTION!
It is necessary to unplug controller from 230V power supply when connecting room thermostat or fuses replacement.

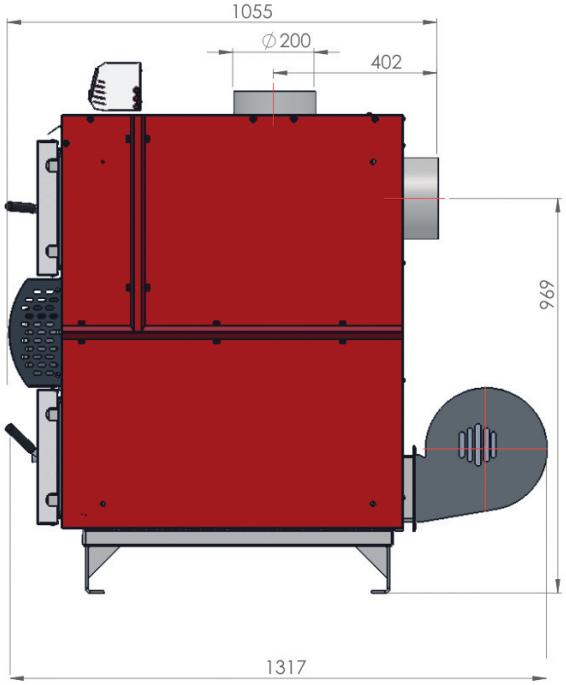
2.3. Technical data of back fan

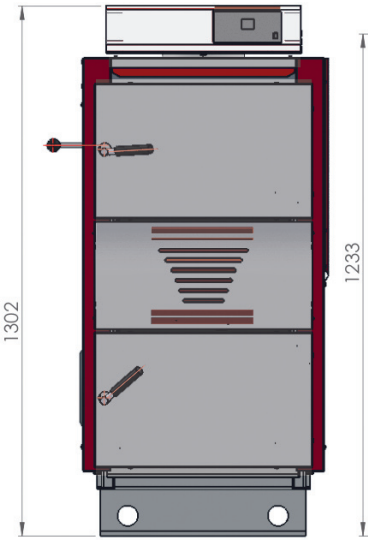
Rotation [rot/min]	Power [kW]	Current I_{zn}[A]	Weight [kg]	Power supply [V]	Noisiness [dB(A)]*
2800	0,55	4,0	14	230	86

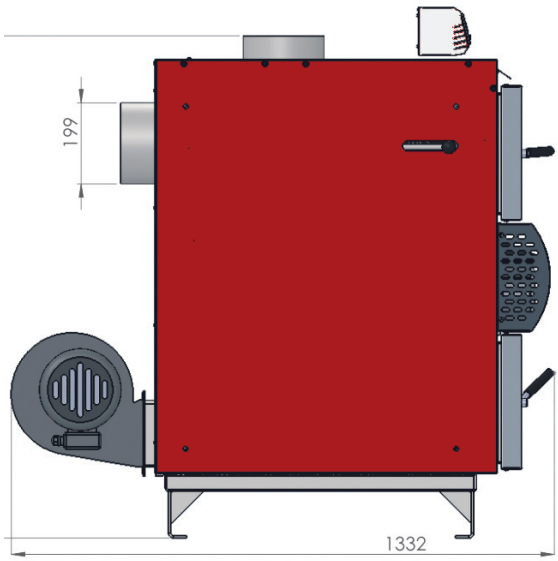
2.4. Electric scheme



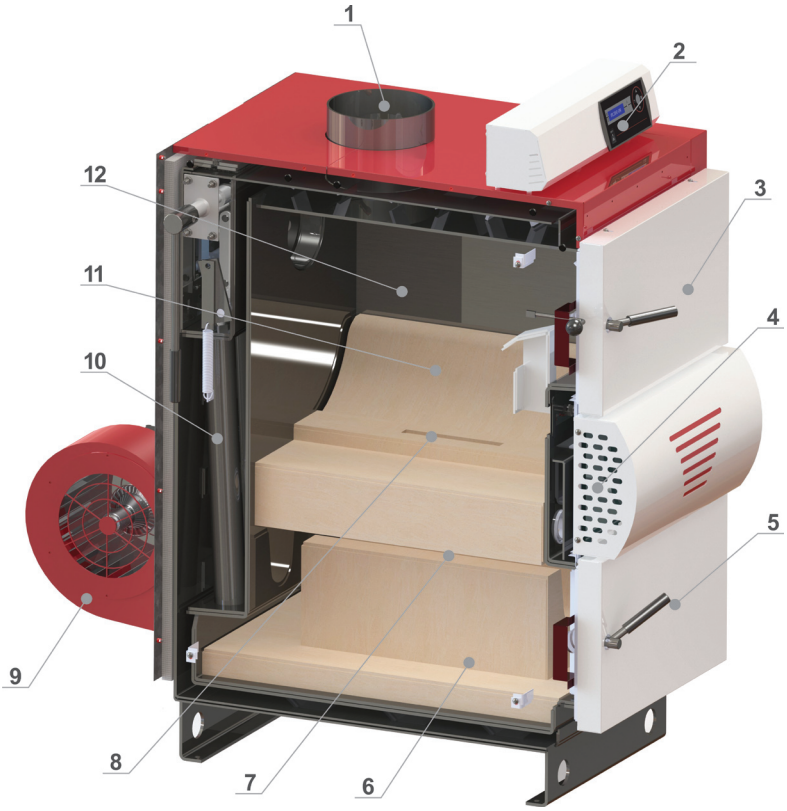
2.5. Dimensions







2.6. Construction of the wood gasification hot air blower



1. Hot air outlet
2. Hot air controller
3. Loading door
4. Front fan
5. Combustion door
6. Firebricks
7. Combustion chamber
8. Nozzle
9. Heater
10. Tube heat exchanger
11. Ceramic moulders
12. Loading (gasification) chamber
13. Chimney flue
14. Chimney flap lever

Main construction parameters' listing

Power		kW	25
Power range		kW	7,5 - 25
Efficiency		%	~ 91
Boiler class (EN 303-5)			3
Boiler weight		kg	546
Volume of loading chamber		dm^3 l	120 120
Loading hole width/lenght		mm	260/432
Burning period		h	7-12
Wood logs lenght		cm	50
Humidity	- recommended	%	15-25
Fuel usage for power: - nominal		kg/h	8,2
Temperatures setting range		°C	50-120
Protection level of controller			IP 40
Voltage/Frequency		V/Hz	230/50
Exhaust gases parameters (at nominal power): - temperature - stream		 °C kg/s	 170-200 ~0,0088
Required chimney draft		mbar Pa	min 0,15 min 15
Flow of hot air		m^3	~1500
Power intake		W	620

3. Troubleshooting

Symptom	Reason	Action
Hot air blower cannot reach set temperature	Wrong lightning up	Check. 5.1 „Lightning up"
	Too humid wood	Humidity control – use wood with proper parameters
	Clogged primary air channels	Call service – after warranty service
	Clogged secondary air pipes	Call service – after warranty service
	Polluted heat exchanger's pipes	Clean with round tool or call service - after warranty service
	Unproper mix of air with wood gases	Call service – after warranty service
	Damaged nozzle	Replace – after warranty service
	Smoking from fan gasket	Replace – after warranty service
	Damaged fan	Replace – after warranty service
Smoking from heat exchanger lid	damaged rope	Screw in lid tightly, replace rope or call service
	hardened rope	Replace rope - after warranty service
	Damaged heat exchanger's lid	Replace lid - call service
Smoking from loading door	Strong wind force exhaust gases into the chimney	Consider installation of appliances supporting chimney draft (WKO)
	Unproper chimney parameters	Rebuild chimney, chimneys weeper assistance
Smoking from door	Leakiness from door	Door adjustment according to 5.2.
	Used rope - leak	Rope replacement or call service - after warranty service
	Damaged door	Door replacement
Controller doesn't work	No voltage in the grid	Check electric installation
	Damaged fuse	Fuse replacement
	Damaged wire	Wire control or replacement
	Damaged boiler sensor	Call service
	Damaged controller	Call service
Fan doesn't work	Damaged fan	Fan replacement – call service
	Fan blades blocked	Check and clean fan
Loud work of fan	Damaged bearings	Call service- fan replacement
	Damaged condenser	Call service – condenser replacement
	Loosen fixing of fan	Fixing control, screw in
	Polluted fan blades	Control, cleaning
	Pitch in fan casing	Control, cleaning

Symptom	Reason	Action
Weak work of fan	Polluted fan blades	Control,cleaning
	Fan flap clogged with pitch	Clean or call service
Explosions in hot air blower	Wrong lightning up	Check “Lightning up“
	Too small chimney draft (below 10Pa)	Rebuild chimney. Install exhaust fan WKO
	Too big chimney draft (above 20 Pa)	Install draft stabilizer
	Too dry wood (humidity below 15 %)	Mix with wood with higher humidity content
	Polluted heat exchanger’s pipes	Clean pipes or call service

4. Ending

Present appliance is marked according to European Directive 2002/96/EC on waste electrical and electronic equipment.

Symbol placed on the components or attached documents means that appliance is not classified as a household waste.

Scrapping should take place in special collection point in order to reuse electrical and electronic components.

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